



LAWRENCE  
LIVERMORE  
NATIONAL  
LABORATORY

# Integrated Chamber Design for the Laser Inertial Fusion Energy (LIFE) Engine

J. F. Latkowski, K. J. Kramer, R. P. Abbott, K. R. Morris, J. DeMuth, L. Divol, B. El-Dasher, A. Lafuente, G. Loosmore, S. Reyes, G. A. Moses, M. Fratoni, D. Flowers, S. Aceves, M. Rhodes, J. Kane, H. Scott, R. Kramer, C. Pantano, C. Scullard, R. Sawicki, S. Wilks, M. Mehl

December 9, 2010

15th International Conference on Emerging Nuclear Energy  
Systems  
San Francisco, CA, United States  
May 15, 2011 through May 19, 2011

## **Disclaimer**

---

This document was prepared as an account of work sponsored by an agency of the United States government. Neither the United States government nor Lawrence Livermore National Security, LLC, nor any of their employees makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or Lawrence Livermore National Security, LLC. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or Lawrence Livermore National Security, LLC, and shall not be used for advertising or product endorsement purposes.

## **Integrated Chamber Design for the Laser Inertial Fusion Energy (LIFE) Engine**

Jeffery F. Latkowski<sup>1</sup>, Kevin J. Kramer, Ryan P. Abbott<sup>1</sup>, Kevin R. Morris<sup>1</sup>, James DeMuth<sup>1</sup>,  
Laurent Divol<sup>1</sup>, Bassem El-Dasher<sup>1</sup>, Antonio Lafuente<sup>1,2</sup>, Gwendolen A. Loosmore<sup>1</sup>,  
Susana Reyes<sup>1</sup>, Gregory A. Moses<sup>3</sup>, Massimiliano Fratoni<sup>1</sup>, Dan Flowers<sup>1</sup>, Sal Aceves<sup>1</sup>,  
Mark Rhodes<sup>1</sup>, Jave Kane<sup>1</sup>, Howard Scott<sup>1</sup>, Richard Kramer<sup>4</sup>, Carlos Pantano<sup>4</sup>,  
Christian Scullard<sup>1</sup>, Rick Sawicki<sup>1</sup>, Scott Wilks<sup>1</sup>, and Marco Mehl<sup>1</sup>

<sup>1</sup>*Lawrence Livermore National Laboratory, Livermore, CA 94550*

<sup>2</sup>*ETSI Industriales, Universidad Politecnica de Madrid, Madrid, Spain*

<sup>3</sup>*Department of Engineering Physics, University of Wisconsin-Madison, WI 53706*

<sup>4</sup>*Department of Mechanical Engineering, University of Illinois at Urbana-Champaign, 61801*  
*Email: latkowski@llnl.gov*

The Laser Inertial Fusion Energy (LIFE) concept is being designed to operate as either a pure fusion or hybrid fusion-fission system. A key component of a LIFE engine is the fusion chamber subsystem. The present work details the chamber design for the pure fusion option.

The fusion chamber consists of the first wall and blanket. This integrated system must absorb the fusion energy, produce fusion fuel to replace that burned in previous targets, and enable both target and laser beam transport to the ignition point. The chamber system also must mitigate target emissions, including ions, x-rays and neutrons and reset itself to enable operation at 10-15 Hz. Finally, the chamber must offer a high level of availability, which implies both a reasonable lifetime and the ability to rapidly replace damaged components. An integrated LIFE design that meets all of these requirements is described herein.

\* This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.